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To Mr. A.J. Crist
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DOMTAR QUARRY SURFACE WATER SURVEY FIRST ANNUAL REPORT, 1981-82

A. Golomb

Surface water quality data for the Mary Fix Creek, which traverses the Domtar Quarry ash disposal site, Mississauga, are reported for 1981-82. To date, no significant change in surface water chemistry appears to have taken place as a result of fly ash landfill operations, which commenced December 18, 1981. Water flow in the Creek has been calibrated, and recommendations are made for installation of a simple chain gauge for convenient flow measurement.

In accordance with the MOE's Provisional Certificate No A220113, a monitoring program of surface water quality and water flow is under way at the Domtar Quarry Reclamation Project, Mississauga.

As shown in Figure 1, (Map 1 'Domtar Quarry: Hydrogeological Study - Supplemental', by Morrison Beatty, Consulting Engineers, Mississauga, which was issued on April 3, 1981), the Mary Fix Creek flows through the Domtar site in a southeasterly direction toward Lake Ontario. After entering the north end via a CN Railway overpass, it crosses the property and leaves it at the south property fence. It then flows through a culvert below Dundas Street, Mississauga and, after passing through a residential area (still under construction), flows below the Paisley Street bridge and on southward to the Lake.

SURFACE WATER QUALITY MONITORING

During the year ending October 31, 1982, sampling and chemical analysis of the Mary Fix Creek was carried out under widely varying conditions, ie during a heavy rainfall (August 27, 1982), during spring runoff (March 14 and 24, 1982), and under baseflow conditions (November 30, 1981; August 13, 1982; and September 24, 1982). An earlier sampling and analysis for major components was carried out under baseflow conditions on May 7, 1980. There were four sampling locations:

job	file	date	report no.
740631-162-892	837.71	November 16, 1982	82-480-K

(a) the CN Railway overpass (downstream end)
(b) the south property fence of Domtar
(c) the Dundas Street culvert (downstream end), and
(d) the Paisley Street bridge.

The procedure followed for collection and analysis of surface water samples is described in detail in the Appendix to this report.

Tables I to IV give detailed chemical analysis of surface waters sampled prior to and following fly ash placement, which commenced December 18, 1981. Major ion chemistry is summarized in Tables V to VIII. This data was used to construct Piper trilinear diagrams for each of the four sampling points (Figures 2 to 5). There appears to be no dominance of major cations or anions throughout the period studied. Water quality was generally within the MOE's Objectives/1/ for surface waters except for Cd, which occasionally exceeded the MOE Objective level of <0.0002 mg/L. No significant change in surface water chemistry appears to have taken place as a result of fly ash deposition at the site.

CALIBRATION OF SURFACE WATER FLOW RATES

Following a reconnaisance of the Mary Fix Creek with the aid of technical personnel from Hydraulic Studies Dept, it appeared that the CN Railway culvert at the northwest limit of the quarry offered the best location to establish a stage discharge relationship. On March 25, 1982, during spring runoff, stream flow rate measurements were made at two separate Creek locations using a Price type current meter and wading rod.

The first Creek section studied was about 20 ft (6 m) downstream of the CN Railway culvert outlet, where several submerged boulders were removed so as to make the flow more uniform. The cross-sectional flow area was plotted, and verticals drawn at 1-ft (0.305 m) intervals across the width of the stream from the surface to the bottom. Velocities were taken at 0.6 of depth at each vertical and the discharge calculated by the 'mid-section method'. In this method, the depth of each vertical is applied to a sectional width which extends halfway to the preceding vertical and halfway to the following vertical, to develop a cross-sectional area. The product of the velocity at a vertical and the corresponding cross-sectional area gives the discharge for each 'panel'. A summation of all panels gives the total discharge, which was calculated to be 0.144 m^3/s at the CN Railway culvert. The second flow measurement was made following the same procedure at a section about 300 ft (91 m) upstream of Dundas Street, and was calculated to be 0.142 m^3/s.

The results were in excellent agreement, and the CN Railway culvert was selected as a suitable location for calibration purposes. Further measurements were made after spring snowmelt on April 21, 1982 (0.069 m^3/s), and during a heavy rainfall on

August 27, 1982 (1.189 m^3/s). Each flow measurement was related to the height of water above the invert at the downstream face of the CNR culvert; the resultant calibration curve is given in Figure 6. Two more points on the curve are needed to improve accuracy of measurement at high flow rates; it is anticipated that this will be completed, weather permitting, before the end of November, 1982.

To provide a convenient and rapid method of checking flow rates of the Mary Fix Creek, it is recommended that a chain gauge be affixed to the downstream face of the CN Railway culvert, with its scale calibrated in terms of discharge as indicated by a pointer which can be adjusted to touch the surface of the stream, vertically above the invert of the culvert. When not in use, the chain gauge could be swung away through 180° and attached to the concrete downstream face of the culvert. This arrangement has the advantage of allowing free flow of the creek to take place in the culvert as compared with a permanent bar gauge or other fixture, which may result in trapping of debris and blockage of the culvert. Permission to install a chain gauge would have to be obtained from CN Railways.

SUMMARY AND CONCLUSIONS

No significant change in surface water quality appears to have taken place to date as a result of fly ash deposition at Domtar Quarry. Surface water quality in the Mary Fix Creek, sampled before and following commencement (on December 18, 1981) of fly ash placement at the site, appears to remain generally within MOE Objectives except for Cd. Discharge of water in the Creek has been monitored, and installation of a simple chain gauge is recommended as a rapid and convenient check of flow rate.

Approved:

D. Harrison
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Submitted:

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AG:km

REFERENCE

1. "Water Management. Goals, Policies, Objectives and Implementation Procedures of the Ministry of the Environment". Published November, 1978.

TABLE I

DOMTAR QUARRY - CHEMICAL ANALYSIS OF SURFACE WATERS

Sampling Point: CN Railway Overpass

Date of Sampling	80 05 07	81 11 30	82 03 14	82 03 24	82 08 13	82 08 27	82 09 24
pH	8.3	8.1	7.0	7.8	8.2	7.9	8.0
Sp Cond (mS/m)	94	47	19	39	124	35	66
Alkalinity OH^-	-	-	<5	<5	<5	<5	<5
as $CO_3^=$	2	-	<5	<5	24	<5	10
$CaCO_3$ HCO_3^-	201	110	36	86	240	64	137
SO_4	81	70	14	26	140	49	95
Cl	136	40	26	60	177	22	85
NO_3	-	<0.1	-	0.1	<0.2	17	-
Ca	81	57	15	34	116	43	72
Mg	24.4	16	2.7	8.3	34	8.4	18
Na	60	20	16	27	97	12	34
K	6	4.9	3.9	4.3	4	3.4	4.9
Ag	-	<0.0002	-	<0.0002	<0.0002	<0.0002	<0.0002
Al	-	<0.2	-	<0.2	<0.06	<0.2	0.5
As	-	-	-	<0.001	0.001	0.002	<0.002
B	-	<0.5	-	<1	<0.5	<0.5	<1
Be	-	-	-	0.1	<0.0002	<0.0002	<0.0002
Ba	-	<1	-	<2	<8	1	1.3
Br	-	0.1	-	0.2	0.6	<0.2	-
Cd	-	0.0009	-	0.003	<0.0001	<0.0001	<0.0001
Cr	-	-	-	0.05	<0.05	<0.05	<0.01
Cr(VI)	-	0.009	-	0.008	0.004	0.003	<0.05
Cu	-	0.003	-	0.005	0.004	0.008	0.003
Fe	-	<0.05	-	0.05	<0.05	<0.05	<0.1
Hg	-	-	-	<0.0002	<0.0002	<0.0002	<0.0002
I	-	<0.01	-	<0.02	<0.2	<0.05	-
Mn	-	<0.05	-	0.2	0.24	<0.02	<0.02
Mo	-	<0.5	-	<0.5	<0.5	<0.5	<0.5
Ni	-	<0.005	-	<0.005	<0.005	<0.005	<0.005
Pb	-	0.002	-	<0.002	<0.002	<0.002	<0.002
Se	-	-	-	<0.001	<0.002	<0.002	<0.002
Sr	-	-	-	0.14	0.8	0.13	0.28
Tl	-	<0.5	-	<1	<2	<1	<1
U	-	<0.01	-	<0.01	<0.06	<0.02	-
V	-	<0.005	-	<0.01	<0.02	<0.003	<0.5
Zn	-	-	-	<0.02	<0.02	<0.02	<0.02
TDS (105°C)	-	370	-	260	756	208	380
TSS (105°C)	-	22	-	17	-	-	31
Total Sol SiO_2	-	5	-	3.3	4.8	3.6	7.4
Hardness (as $CaCO_3$)	303	208	208	119	429	142	253
TOC	-	-	-	15	22	12	17

Note: Solute concentrations given in milligrams per litre.

TABLE II

DOMTAR QUARRY - CHEMICAL ANALYSIS OF SURFACE WATERS

Sampling Point: South Property Fence

Date of Sampling	80 05 07	80 12 16	81 11 30	82 03 14	82 03 24	82 08 13	82 08 27	82 09 24
pH	8.5	8.2	8.2	7.4	7.9	8.2	7.9	8.1
Sp Cond (mS/m)	90	410	50	23.3	36.5	600	43	107
Alkalinity OH^-	-	-	-	<5	<5	<5	<5	<5
as $CO_3^=$	5.6	-	-	<5	<5	14	<5	13
$CaCO_3$ HCO_3^-	190	198	110	40	83	99	63	120
SO_4	78	120	72	14	23	450	63	145
Cl	122	1060	42	34	55	1700	41	215
NO_3	-	-	<0.1	-	0.1	15	21	-
Ca	79	162	57	17	33	250	45	72
Mg	22.8	45	16	3.3	8.1	54	8.6	18
Na	61	585	26	19	28	900	2.9	105
K	5	7.3	5.4	4.0	4.6	42	4.1	9.8
Ag	-	-	0.0002	-	<0.0002	<0.0002	<0.0002	<0.0002
Al	-	-	<0.2	-	<0.2	<3	<0.2	0.5
As	-	-	-	-	<0.001	<0.001	<0.002	<0.002
B	-	-	<0.05	-	<1	2.5	0.5	<1
Be	-	-	-	-	-	<0.0002	<0.0002	<0.002
Ba	-	-	<1	-	<2	<40	1	1.4
Br	-	-	0.1	-	<0.2	16	0.3	-
Cd	-	-	0.0002	-	<0.0001	<0.0001	<0.0001	<0.0001
Cr	-	-	-	-	<0.05	0.05	<0.05	<0.1
Cr(VI)	-	-	0.005	-	<0.005	0.004	0.004	<0.05
Cu	-	-	0.003	-	0.005	0.007	0.007	0.003
Fe	-	-	0.05	-	0.05	<0.05	<0.05	<0.1
Hg	-	-	-	-	-	<0.0002	<0.0002	<0.0002
I	-	-	<0.01	-	<0.02	<1	<0.05	-
Mn	-	-	<0.05	-	0.2	0.04	<0.02	<0.02
Mo	-	-	0.5	-	<0.5	<0.5	0.5	<0.5
Ni	-	-	<0.005	-	<0.005	0.012	<0.005	<0.005
Pb	-	-	<0.002	-	0.002	<0.002	<0.002	<0.002
Se	-	-	-	-	<0.001	<0.002	<0.002	<0.002
Sr	-	-	-	-	0.14	4.8	0.20	0.64
Ti	-	-	<0.05	-	<1	<10	<1	<1
U	-	-	<0.01	-	<0.01	<0.3	<0.02	-
V	-	-	<0.005	-	<0.01	<0.1	<0.003	<0.5
Zn	-	-	-	-	<0.02	<0.002	<0.02	<0.02
TDS (105°C)	-	-	370	-	252	3770	260	618
TSS (105°C)	-	-	41	-	15	-	-	85
Total Sol SiO_2	-	-	6.5	-	3.8	26	4.0	6.8
Hardness (as $CaCO_3$)	291	590	215	56	116	869	148	253
TOC	-	-	-	-	15	9	10	17

Note: Solute concentrations given in milligrams per litre.

TABLE III

DOMTAR QUARRY - CHEMICAL ANALYSIS OF SURFACE WATERS

Sampling Point: Dundas Street Culvert

Date of Sampling	82 03 14	82 08 13	82 08 27	82 09 24
pH	7.2	8.1	7.9	8.2
Sp Cond (mS/m)	20	560	42	105
Alkalinity OH^-	<5	<5	<5	<5
as $CO_3^=$	<5	17	<5	13
$CaCO_3$ HCO_3^-	36	92	66	121
SO_4	14	450	61	110
Cl	26	1575	38	165
NO_3	-	13	21	-
Ca	15	262	44	70
Mg	2.7	55	88	18
Na	14	835	2.7	98
K	3.9	38	4.2	9.5
Ag	-	<0.0002	<0.0002	<0.0002
Al	-	<3	<0.2	0.5
As	-	<0.001	<0.002	<0.002
B	-	2.5	<0.5	<1
Be	-	<0.0002	<0.0002	<0.0002
Ba	-	<40	1	1.3
Br	-	14	0.3	-
Cd	-	<0.0001	<0.0001	<0.0001
Cr	-	<0.05	<0.05	<0.1
Cr(VI)	-	0.005	0.006	<0.05
Cu	-	0.007	0.007	0.005
Fe	-	<0.05	<0.05	<0.1
Hg	-	<0.0002	0.0002	<0.0002
I	-	<1	<0.05	-
Mn	-	<0.02	<0.02	<0.02
Mo	-	<0.5	<0.5	<0.5
Ni	-	0.012	<0.5	0.005
Pb	-	<0.002	<0.002	<0.002
Se	-	0.022	<0.002	<0.002
Sr	-	5.5	0.2	0.59
Ti	-	<10	<1	<1
U	-	<0.3	<0.02	-
V	-	<0.1	0.003	<0.5
Zn	-	<0.02	<0.02	<0.02
TDS (105°C)	-	3408	262	587
TSS (105°C)	-	-	-	53
Total Sol SiO_2	-	2.3	2.4	6.4
Hardness (as $CaCO_3$)	49	881	146	149
TOC	-	10	9	16

Note: Solute concentrations given in milligrams per litre.

TABLE IV

DOMTAR QUARRY - CHEMICAL ANALYSIS OF SURFACE WATERS

Sampling Point: Paisley Street Bridge

Date of Sampling	81 11 30	82 03 14	82 08 13	82 08 27	82 09 24
pH	8.1	7.9	8.3	7.9	8.0
Sp Cond (mS/m)	48	39	141	41	79
Alkalinity OH^-	-	<5	<5	<5	<5
as $CO_3^=$	-	<5	19	<5	9
$CaCO_3$ HCO_3^-	110	86	160	65	133
SO_4	74	24	175	59	140
Cl	46	50	242	38	165
NO_3	0.5	0.1	3	21	-
Ca	58	34	97	43	70
Mg	16	8.1	22	8.7	18
Na	26	30	173	2.7	55
K	5.8	4.7	11	4.2	6.2
Ag	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Al	<0.2	<0.2	<0.6	0.2	0.5
As	-	<0.001	<0.001	<0.002	<0.002
B	<0.5	<1	<0.5	<0.5	<1
Be	-	-	<0.0002	<0.0002	<0.0002
Ba	<1	<2	<8	1	1.4
Br	<0.1	<0.2	1.6	0.3	-
Cd	0.001	<0.0001	<0.0001	<0.0001	<0.0001
Cr	-	<0.05	<0.05	<0.05	<0.1
Cr(VI)	0.005	0.007	0.004	0.004	<0.05
Cu	0.003	0.005	0.007	0.012	0.007
Fe	<0.05	0.05	<0.05	<0.05	<0.1
Hg	-	<0.0002	<0.0002	0.0002	<0.0002
I	<0.01	<0.02	<0.2	<0.05	-
Mn	<0.5	<0.1	<0.02	<0.02	<0.02
Mo	<0.5	<0.5	<0.5	<0.5	<0.5
Ni	<0.05	<0.005	0.012	<0.005	0.010
Pb	0.009	<0.002	<0.002	<0.002	<0.002
Se	-	<0.001	<0.001	<0.002	<0.002
Sr	-	0.14	1.12	0.2	0.4
Ti	<0.5	<1	<2	<1	<1
U	<0.01	<0.01	<0.06	<0.02	-
V	<0.005	<0.01	<0.02	0.003	<0.5
Zn	-	<0.02	<0.02	<0.02	<0.02
TDS (105°C)	370	236	838	242	489
TSS (105°C)	48	22	-	-	34
Total Sol SiO_2	15	2.6	3.7	4.1	6.2
Hardness (as $CaCO_3$)	211	118	333	143	149
TOC	-	14	17	10	16

Note: Solute concentrations given in milligrams per litre.

TABLE V

DOMTAR QUARRY - MAJOR ION CHEMISTRY
SAMPLE POINT: CN RAILWAY OVERPASS

CATIONS														
Date	Ca			Mg			Na			K			Cation Total (EPM)	Anion Total (EPM)
	mg/L	EPM	% EPM	mg/L	EPM	% EPM	mg/L	EPM	% EPM	mg/L	EPM	% EPM		
80 05 07	81	4.04	45.86	24.4	2.01	22.81	60	2.61	29.63	6	0.15	1.70	8.81	9.58
81 11 30	57	2.85	55.56	16	1.28	24.95	20	0.87	16.96	4.9	0.13	2.53	5.13	4.79
82 03 13	14	0.70	40.46	2.4	0.20	11.56	16	0.70	40.46	4.9	0.13	7.51	1.73	1.71
82 03 14	15	0.75	42.37	2.7	0.22	12.43	16	0.70	39.55	3.9	0.10	5.65	1.77	1.74
82 03 24	34	1.70	46.45	8.3	0.68	18.58	27	1.17	31.97	4.3	0.11	3.01	3.66	3.95
82 08 13	116	5.80	44.89	34	2.80	21.67	97	4.22	32.66	4	0.10	0.78	12.92	13.19
82 08 27	43	2.15	62.32	8.4	0.69	20.00	12	0.52	15.07	3.4	0.09	2.61	3.45	2.92
82 09 24	72	3.6	53.82	18	1.48	22.12	34	1.48	22.12	4.9	0.13	1.94	6.69	7.34

ANIONS											
Date	Cl			SO_4			Total Alkalinity (HCO_3^-, $CO_3^=$, OH^-) as $CaCO_3$			Anion Total (EPM)	Cation Total (EPM)
	mg/L	EPM	% EPM	mg/L	EPM	% EPM	mg/L	EPM	% EPM		
80 05 07	136	3.84	40.08	81	1.68	17.54	203	4.06	42.38	9.58	8.81
81 11 30	40	1.13	23.59	70	1.46	30.48	110	2.2	45.43	4.79	5.13
82 03 13	29	0.82	47.95	12	0.25	14.62	32	0.64	37.43	1.71	1.73
82 03 14	26	0.73	41.95	14	0.29	16.67	36	0.72	41.38	1.74	1.77
82 03 24	60	1.69	42.78	26	0.54	13.67	86	1.72	43.54	3.95	3.66
82 08 13	177	4.99	37.83	140	2.92	22.14	264	5.28	40.03	13.19	12.92
82 08 27	22	0.62	21.23	49	1.02	34.93	64	1.28	43.86	2.92	3.45
82 09 24	85	2.39	32.69	95	1.98	27.09	147	2.94	40.22	7.31	6.69

TABLE VI

DOMTAR QUARRY - MAJOR ION CHEMISTRY
SAMPLE POINT: SOUTH PROPERTY FENCE

CATIONS														
Date	Ca			Mg			Na			K			Cation Total (EPM)	Anion Total (EPM)
	mg/L	EPM	% EPM	mg/L	EPM	% EPM	mg/L	EPM	% EPM	mg/L	EPM	% EPM		
80 05 07	79	3.94	45.87	22.8	1.87	21.77	61	2.65	30.85	5.0	0.13	1.51	8.59	8.97
80 12 16	162	8.08	21.59	45	3.70	9.89	585	24.45	63.01	7.3	0.19	0.51	37.42	36.35
81 11 30	57	2.85	52.78	16	1.28	23.70	26	1.13	20.93	5.4	0.14	2.59	5.40	4.87
82 03 14	17	0.85	41.46	3.3	0.27	13.17	19	0.83	40.49	4.0	0.10	4.88	2.05	2.05
82 03 24	33	1.65	45.08	8.1	0.67	18.31	28	1.22	33.33	4.6	0.12	3.28	3.66	3.69
82 08 13	259	12.95	22.48	54	4.44	7.71	900	39.13	67.93	42	1.08	1.88	57.60	59.53
82 08 27	45	2.25	70.31	8.6	0.71	22.19	2.9	0.13	4.06	4.1	0.11	3.44	3.20	3.72
82 09 24	72	3.6	36.36	18	1.48	14.96	105	4.57	46.16	9.8	0.25	2.52	9.90	11.74

ANIONS											
Date	Cl			SO_4			Total Alkalinity (HCO_3^-, $CO_3^=$, OH^-) as $CaCO_3$			Anion Total (EPM)	Cation Total (EPM)
	mg/L	EPM	% EPM	mg/L	EPM	% EPM	mg/L	EPM	% EPM		
80 05 07	122	3.44	38.35	78	1.62	18.06	195.6	3.91	42.59	8.97	8.59
80 12 16	1060	29.89	82.89	120	2.50	6.88	198.0	3.96	10.89	36.35	37.42
81 11 30	42	1.18	24.23	72	1.49	30.60	110	2.2	45.17	4.87	5.40
82 03 14	34	0.96	2.05	14	0.29	14.15	40	0.8	39.02	2.05	2.05
82 03 24	55	1.55	3.69	23	0.48	13.01	83	1.66	44.99	3.69	3.66
82 08 13	1700	47.89	80.45	450	9.38	15.75	113	2.26	3.80	59.53	57.60
82 08 27	41	1.15	30.91	63	1.31	35.22	63	1.26	33.87	3.72	3.20
82 09 24	215	6.06	51.62	145	3.02	25.72	133	2.66	22.66	11.74	9.90

TABLE VII

DOMTAR QUARRY - MAJOR ION CHEMISTRY
SAMPLE POINT: DUNDAS ST. CULVERT

CATIONS														
Date	Ca			Mg			Na			K			Cation Total (EPM)	Anion Total (EPM)
	mg/L	EPM	% EPM	mg/L	EPM	% EPM	mg/L	EPM	% EPM	mg/L	EPM	% EPM		
82 03 24	15	0.75	44.64	2.7	0.22	13.10	14	0.61	36.31	3.9	0.10	5.95	1.68	1.74
82 08 13	262	13.1	23.86	55	4.53	8.25	835	36.30	66.12	38	0.97	1.77	54.90	55.93
82 08 27	44	2.2	69.84	8.8	0.71	22.86	2.7	0.12	3.81	4.2	0.11	3.49	3.15	3.66
82 09 24	70	3.5	36.92	18	1.48	15.61	98	4.26	44.94	9.5	0.24	2.53	9.48	9.62

ANIONS											
Date	Cl			SO_4			Total Alkalinity (HCO_3^-, $CO_3^=$, OH^-) as $CaCO_3$			Anion Total (EPM)	Cation Total (EPM)
	mg/L	EPM	% EPM	mg/L	EPM	% EPM	mg/L	EPM	% EPM		
82 03 24	26	0.73	41.95	14	0.29	16.67	36	0.72	41.38	1.74	1.68
82 08 13	1575	44.37	79.33	450	9.38	16.77	109	2.18	3.90	55.93	54.90
82 08 27	38	1.07	29.23	61	1.27	34.70	66	1.32	36.07	3.66	3.15
82 09 24	165	4.65	48.34	110	2.29	23.80	134	2.68	27.86	9.62	9.48

TABLE VIII

DOMTAR QUARRY - MAJOR ION CHEMISTRY
SAMPLE POINT: PAISLEY ST. BRIDGE

CATIONS														
Date	Ca			Mg			Na			K			Cation Total (EPM)	Anion Total (EPM)
	mg/L	EPM	% EPM	mg/L	EPM	% EPM	mg/L	EPM	% EPM	mg/L	EPM	% EPM		
81 11 30	58	2.9	52.82	16	1.32	24.04	26	1.13	20.58	5.8	0.14	2.55	5.49	5.04
82 03 24	34	1.70	44.74	8.1	0.67	17.63	30	1.31	34.47	4.7	0.12	3.16	3.80	3.63
82 08 13	97	4.85	33.54	22	1.81	12.52	173	7.52	52.00	11	0.28	1.94	14.46	14.04
82 08 27	44	2.2	69.84	8.8	0.72	22.86	2.7	0.12	3.81	4.2	0.11	3.49	3.15	3.60
82 09 24	70	3.5	46.48	18	1.48	19.65	55	2.39	31.74	6.2	0.16	2.12	7.53	10.41

ANIONS											
Date	Cl			SO_4			Total Alkalinity (HCO_3^-, $CO_3^=$, OH^-) as $CaCO_3$			Anion Total (EPM)	Cation Total (EPM)
	mg/L	EPM	% EPM	mg/L	EPM	% EPM	mg/L	EPM	% EPM		
81 11 30	46	1.30	25.79	74	1.54	30.56	110	2.20	43.65	5.04	5.49
82 03 24	50	1.41	38.84	24	0.50	13.77	86	1.72	47.38	3.63	3.80
82 08 13	242	6.81	48.50	175	3.65	26.00	179	3.58	25.50	14.04	14.46
82 08 27	38	1.07	29.72	59	1.23	34.17	65	1.30	36.11	3.60	3.15
82 09 24	165	4.65	44.67	140	2.92	28.05	142	2.84	27.28	10.41	7.53

APPENDIX

Samples were collected in specially acid-pretreated linear polyethylene (LPE) 1-L bottles, stored in a cooler (~4°C) and returned the same day to the laboratory for filtration and preservation.

Each sample was laboratory filtered through a 0.45 µm Millipore filter to remove suspended solids. The glass Millipore vacuum filtration apparatus was cleaned by soaking in 1:1 hydrochloric acid (HCl) followed by a deionized water rinse and a further soaking in 1:1 nitric acid (HNO_3). This was followed by several thorough rinsings with deionized water. Millipore filters were rinsed by passing 500 mL of deionized water through the filter and discarding the filtrate. A small volume (~20 mL) of the sample was passed through the filter and also discarded, then the bulk of the sample was filtered. The empty original sample container was rinsed several times with deionized water, given a final rinse using a small volume (~10 mL) of sample filtrate, and reused for storing the unacidified portion.

The portion of the filtrate for trace metal analysis was acidified with ultrapure HNO_3 to a background concentration of 0.1 M. The unacidified portion for alkalinity and anion analysis was stored at 4°C.

DOMTAR
QUARRY
RECLAMATION PROJECT
MISSISSAUGA
HYDROGEOLOGIC
STUDY
LEGEND
STREAM AND POND SAMPLES
FIGURE 1
map 1
CNR OVERPASS
S. PROPERTY FENCE
DUNDAS ST. CULVERT
PAISLEY ST.
BRIDGE
SUMP

o *Before Ash Placement Commenced*

● *After Ash Placement Commenced*

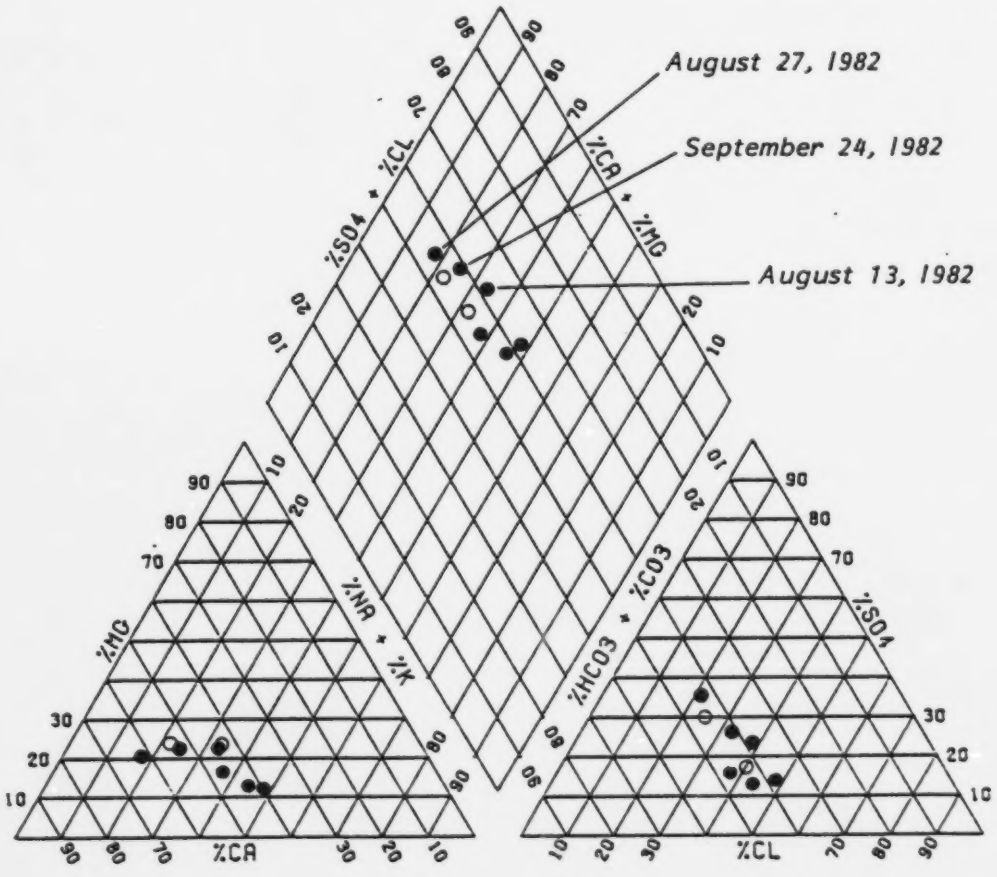

FIGURE 2

DOMTAR QUARRY
PIPER DIAGRAM
MAJOR ION CHEMISTRY
LOCATION: CN RAILWAY OVERPASS

o *Before Ash Placement Commenced*

● *After Ash Placement Commenced*

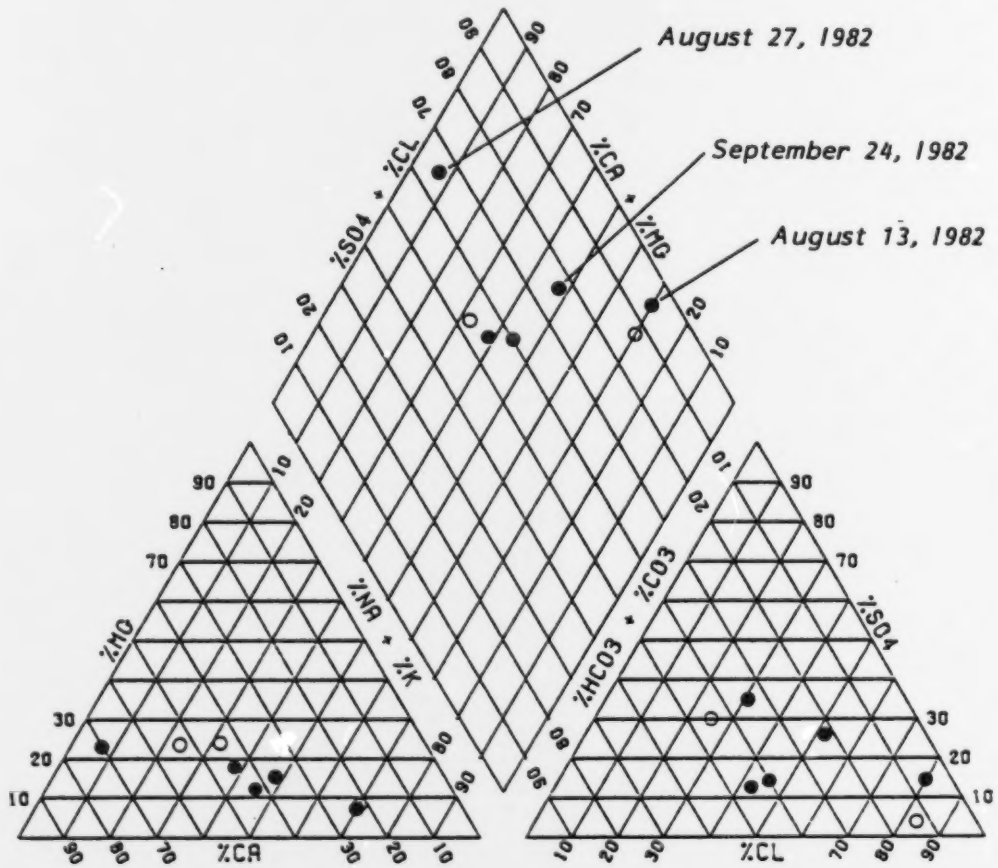

FIGURE 3

DOMTAR QUARRY
PIPER DIAGRAM
MAJOR ION CHEMISTRY
LOCATION: SOUTH PROPERTY FENCE

● *After Ash Placement Commenced*

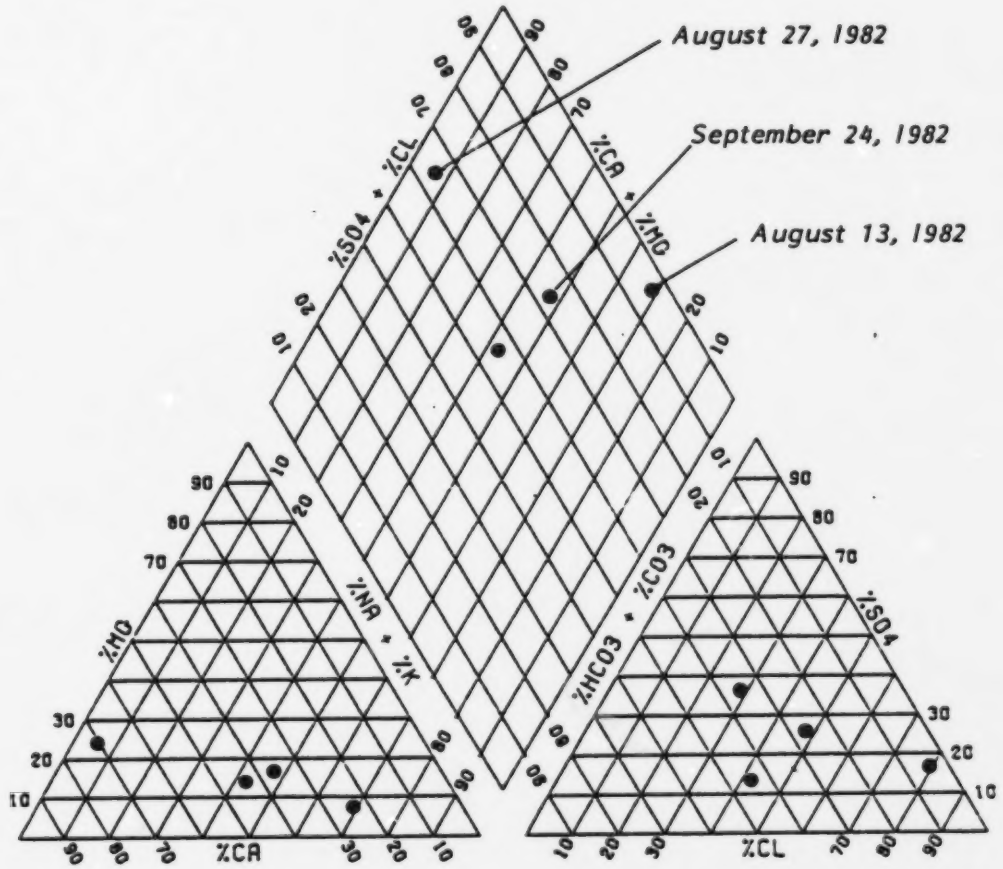

FIGURE 4

DOMTAR QUARRY
PIPER DIAGRAM
MAJOR ION CHEMISTRY
LOCATION: DUNDAS STREET CULVERT

○ *Before Ash Placement Commenced*

● *After Ash Placement Commenced*

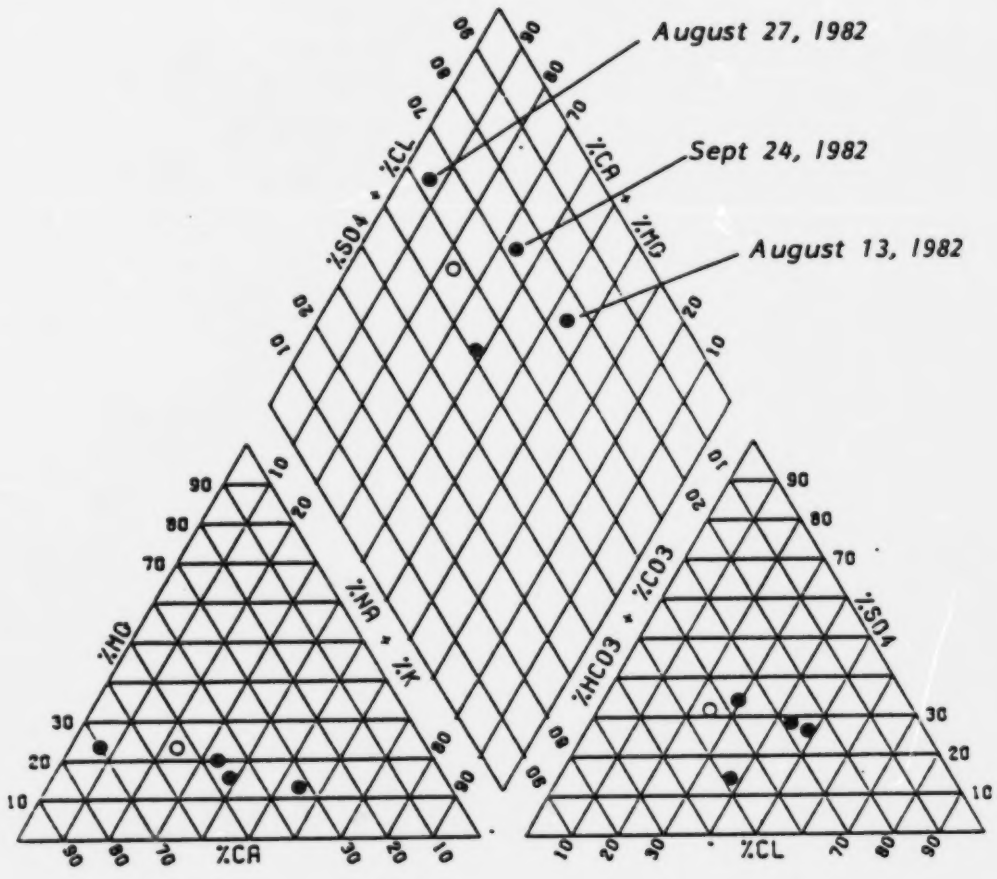

FIGURE 5

DOMTAR QUARRY
PIPER DIAGRAM
MAJOR ION CHEMISTRY
LOCATION: PAISLEY STREET BRIDGE

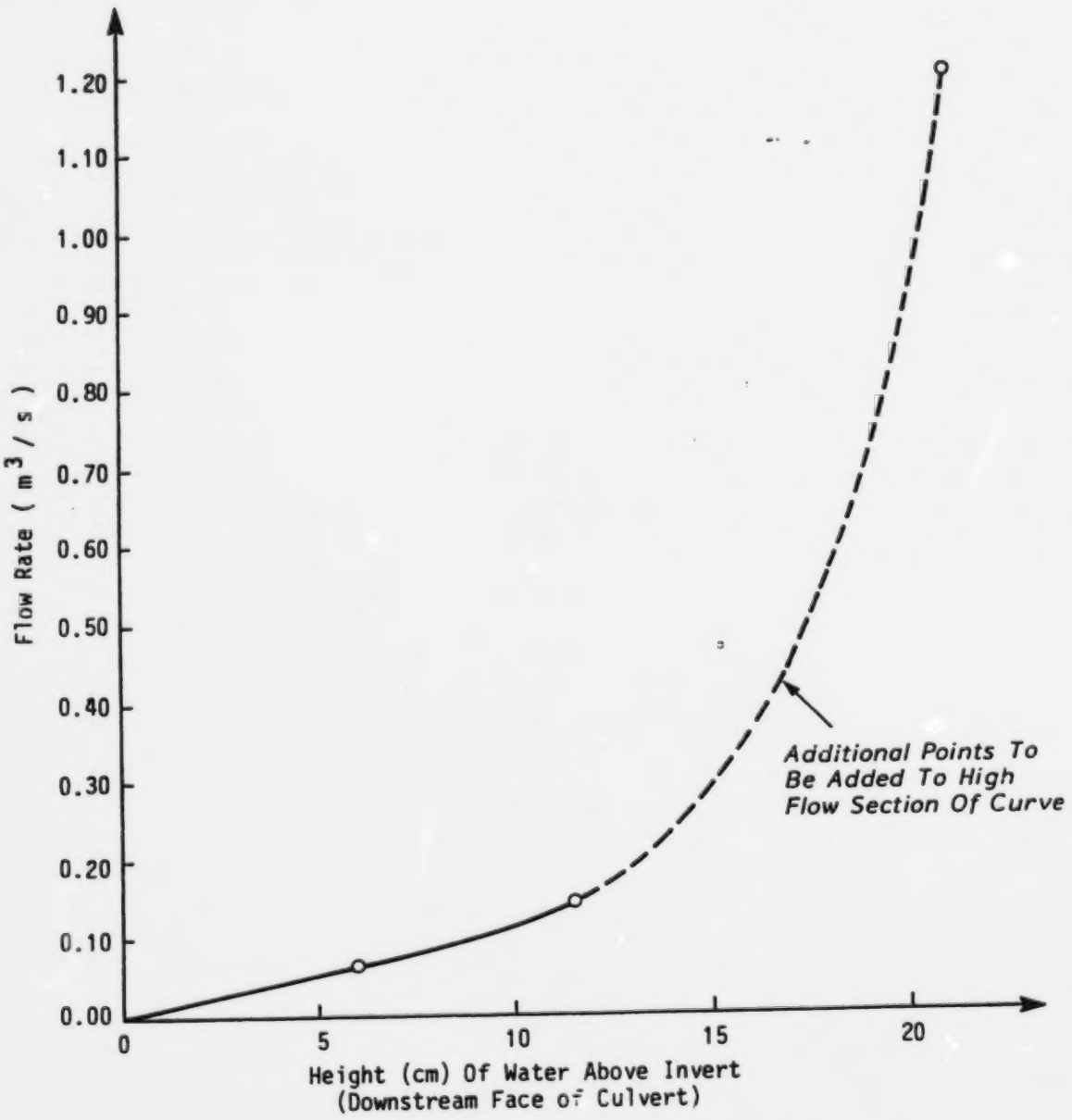

FIGURE 6

CALIBRATION CURVE OF MARY FIX CREEK DISCHARGE
AT CN RAILWAY CULVERT

POOR

QUALITY

ORIGINAL